

ANTACIDS

Vitamin C

Antacids deplete vitamin C (ascorbic acid) because at high gastric pH (lower acidity), vitamin C is readily destroyed in the stomach; Compounding this effect, people with gastritis may also have an increased requirement for vitamin C needed to repair damage to gastric mucosa.^{1,31,32,33,34}

Magnesium

In 2011, the FDA issued a warning that prolonged antacid use impairs magnesium absorption to the point of increased risk of fractures. Antacid-induced magnesium deficiency may also increase risk of arrhythmias.^{1,6,7,8,9}

Vitamin A

Combining vitamin A, which protects stomach walls, with antacid meds may reduce ulcer size more than antacids alone.^{29,30}

Vitamin B12

The absorption of B12 from food requires an acidic environment which is why it is well-established that heartburn meds (which lower stomach acid) contribute to B12 deficiency and its associated conditions such as anemia and fatigue.^{1,2,3,4,5}

Zinc

Antacids can dramatically impair absorption and body stores of zinc, even when supplemented aggressively.^{10,11,12}

Folic Acid

The enzyme needed to carry folic acid into the body from the gut is deactivated by antacid meds, which can ultimately causes folic acid deficiency in chronic antacid users. Some suggest something similar happens with vitamin B1.^{25,26,27,28}

Copper

Proton pump inhibitors bind to copper rendering it biologically unavailable; Data suggest PPIs may increase risk of certain neurological complications due to copper deficiency.^{13,14,15}

Vitamin E

Compared to omeprazole, vitamin E (tocotrienol) shows similar effectiveness in alleviating stress-induced ulcers, but without some of the long-term side effects.^{19,20,21}

Calcium

Bone cells (osteoclasts) use proton pumps to pull minerals into bones which is why proton pump inhibitors may increase risk of osteoporosis since they impair bone tissue's ability to absorb calcium; Antacids also decrease intestinal calcium uptake thus compounding this effect.^{1,16,17,18}

Antioxidants (CoQ10)

Omeprazole damages the lining of the stomach via its indiscriminate oxidation of stomach tissue, which may be prevented with antioxidant therapy; Coenzyme Q10 may reduce PPI-induced Inflammatory damage on the lining of the stomach.^{22,23,24}

Generic names for Proton Pump Inhibitors (PPI) include omeprazole, lansoprazole, esomeprazole and pantoprazole.

Generic names for Histamine2 (H2) receptor agonists include cimetidine, famotidine, nizatidine and ranitidine.

Brand names for PPI include Prilosec, Prevacid, and Nexium.

Brand names for H2 receptor agonists include Pepcid, Tagemet, Axid and Zantac.

REFERENCES

- ¹Heidelbaugh J. Proton pump inhibitors and risk of vitamin and mineral deficiency: evidence and clinical implications. *Ther Adv Drug Saf.* 2013;4:125-133.
- ²Jung SB, Nagaraja V, Kapur A et al. Association between vitamin B12 deficiency and long-term use of acid-lowering agents: a systematic review and meta-analysis. *Intern Med J.* 2015;45:409-416.
- ³Lam J, Schneider J, Zhao W et al. Proton pump inhibitor and histamine 2 receptor antagonist use and vitamin B12 deficiency. *JAMA* 2013;310:2435-2442.
- ⁴Bellou A, Aimone-Gastin I, de Korwin J et al. Cobalamin deficiency with megaloblastic anemia in one patient under long-term omeprazole therapy. *J Intern Med* 1996;240:161-164.
- ⁵Shikata T, Sasaki N, Ueda M et al. Use of proton pump inhibitors is associated with anemia in cardiovascular outpatients. *Circ J* 2015;79:193-200.
- ⁶FDA Drug Safety Communication: Low magnesium levels can be associated with long-term use of Proton Pump Inhibitor drugs (PPIs). *United States Food and Drug Administration.* March 2, 2011.
- ⁷FDA Consumer Health Information Flyer: Possible Increased Risk of Bone Fractures with Certain Antacid Drugs. *United States Food and Drug Administration.* March 2010.
- ⁸El-Charabaty E, Saifan C, Abdallah M et al. Effects of proton pump inhibitors and electrolyte disturbances on arrhythmias. *Int J Gen Med* 2013;6:515-518.
- ⁹Mackay J, Bladon P. Hypomagnesaemia due to proton-pump inhibitor therapy: a clinical case series. *QJM* 2010;103:387-395.
- ¹⁰Farrell C, Morgan M, Rudolph D et al. Proton pump inhibitors interfere with zinc absorption and zinc body stores. *Gastro Research* 2011;4:243-251.
- ¹¹Sturniolo G, Montino M, Rossetto L et al. Inhibition of gastric acid secretion reduces zinc absorption in man. *J Am Coll Nutr* 1991;10:372-375.
- ¹²Ozutemiz A, Aydin H, Isler M et al. Effect of omeprazole on plasma zinc levels after oral zinc administration. *Indian J Gastroenterol.*2002;21:216-218.
- ¹³Plantone D, Renna R, Primiano G et al. PPIs as a possible risk factor for copper deficiency myelopathy. *J Neurol Sci* 2015;349:258-259.
- ¹⁴Hamdam I. In vitro study of the interaction between omeprazole and the metal ions Zn(II), Cu(II), and Co(II). *Pharmazie* 2001;56:877-881.
- ¹⁵Baek S, Lee S. Proton pump inhibitors decrease melanogenesis in melanocytes. *Biomed Rep* 2015;3:726-730.
- ¹⁶Kopic S, Geibel J. Gastric acid, calcium absorption, and their impact on bone health. *Physiol Rev.* 2013;93:189-268.
- ¹⁷Liamis G, Miionis H, Elisaf M. A review of drug-induced hypocalcemia. *J Bone Miner Metab.* 2009;27:635-642.
- ¹⁸Yang Y, Lewis J, Epstein S et al. Long-term proton pump inhibitor therapy and risk of hip fracture. *JAMA* 2006;296:2947-2953.
- ¹⁹NurAzlina M, Kamisah Y, Chua K et al. Preventive Effects of Tocotrienol on Stress-Induced Gastric Mucosal Lesions and Its Relation to Oxidative and Inflammatory Biomarkers. *PLoS One.* 2015;10:e0139348.
- ²⁰Huilgol S, Kumar V. Evaluation of antiulcerogenic potential of antioxidant α -tocopherol in pylorus-ligated albino rats. *J Basic Clin Physiol Pharmacol* 2014;25:81-85.
- ²¹Hao J, Zhang B, Lui B et al. Effect of alpha-tocopherol, N-acetylcysteine and omeprazole on esophageal adenocarcinoma formation in a rat surgical model. *Int J Cancer* 2009;124:1270-1275
- ²²Kohler J, Blass A, Liu J et al. Antioxidant pre-treatment prevents omeprazole-induced toxicity in an in vitro model of infectious gastritis. *Free Radic Biol Med.* 2010;49:786-791.
- ²³Rahmani A, Abangah G, Moradkani A et al. Coenzyme Q10 in combination with triple therapy regimens ameliorates oxidative stress and lipid peroxidation in chronic gastritis associated with H. pylori infection. *J Clin Pharmacol.* 2015;55:842-827.
- ²⁴Shin J, Sachs G. Restoration of acid secretion following treatment with proton pump inhibitors. *Gastroenterology.* 2002;123:1588-1597.
- ²⁵Urquhart B, Gregor J, Chande N et al. The human proton-coupled folate transporter (hPCFT): modulation of intestinal expression and function by drugs. *Am J Physiol Gastrointest Liver Physiol.* 2010;298:G248-254.
- ²⁶Russell R, Golner B, Krasinski S et al. Effect of antacid and H2 receptor antagonists on the intestinal absorption of folic acid. *J Lab Clin Med.* 1988;112:458-463.
- ²⁷Prasad P, Mahesh V, Leibach F et al. Functional coupling between a bafilomycin A1-sensitive proton pump and a probenecid-sensitive folate transporter in human placental choriocarcinoma cells. *Biochim Biophys Acta.* 1994;1222:309-314.
- ²⁸Brown R. The proton channel blocking agent omeprazole is an inhibitor of the thiamin shuttle. *J Theor Biol.* 1990;143:565-573.
- ²⁹Patty I, Benedek S, Deak G et al. Cytoprotective effect of vitamin A and its clinical importance in the treatment of patients with chronic gastric ulcer. *Int J Tissue React* 1983;5:301-307.
- ³⁰Tang G, Serfaty-Lacrosniere C, Camilo M et al. Gastric acidity influences the blood response to a beta-carotene dose in humans. *Am J Clin Nutr.* 1996;63:622-626.
- ³¹Aditi A, Graham D. Vitamin C, gastritis, and gastric disease: a historical review and update. *Dig Dis Sci.* 2012;57:2504-2515.
- ³²Henry E, Carswell A, Wirz A et al. Proton pump inhibitors reduce the bioavailability of dietary vitamin C. *Aliment Pharmacol Ther.* 2005;22:539-545.
- ³³Mowat C, McColl K. Alterations in intragastric nitrite and vitamin C levels during acid inhibitory therapy. *Best Pract Res Clin Gastroenterol.* 2001;15:523-537.
- ³⁴McColl K. Effect of proton pump inhibitors on vitamins and iron. *Am J Gastroenterol.* 2009;104:Suppl S5-9.

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